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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/902,594	07/12/2001	Tsuyoshi Shibata	862.C2293	9420

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EXAMINER

LIANG, LEONARD S

ART UNIT PAPER NUMBER

2853

DATE MAILED: 12/20/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/902,594

Applicant(s)

SHIBATA, TSUYOSHI

Examiner

Leonard S Liang

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-14 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1,3-9 and 11-14 is/are rejected.
- 7) ☒ Claim(s) 2 and 10 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☒ The proposed drawing correction filed on 09 October 2002 is: a) ☒ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) ____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). ____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: ____

DETAILED ACTION

Claim Objections

- Claims 5-7 are objected to because of the following informalities: The claims state "The apparatus...by discharging one or plurality of ink droplets..." This is grammatically incorrect. It will be construed that the claim should be construed "The apparatus...by discharging one or a plurality of ink droplets..." ". Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

- Claims 1, 9, and 14 are rejected under 35 U.S.C. 102(b) as being anticipated by Chan et al (US Pat 5111302).

Chan et al discloses:

- {claim 1} An ink jet printing apparatus (column 1, lines14-19); means for storing a first table indicating a pixel density distribution pattern where a pixel density distribution within predetermined pixels is patterned (figure 4);

Example of filling in the image plane

Color Type	Black	Cyan	Magenta	Yellow
High				
Medium				
Low				

Example

	High	Medium	Low
R = (2, 2, 0)			
G = (2, 2, 0)			
B = (1, 0, 2)			
Y = (0, 1, 0)			

Fig. 4

means for storing a second table indicating combinations of density distribution patterns of print pixels and the ink ejection print elements in correspondence with gray scale values (figure 2B);

32 Levels Gray Table
Based on 2x2 super-pixel
Define density (reflectance) ratio to be:
d1:d2:d3 = 8:3:1

LEVEL	1/4	2/4	3/4	4/4
1	0.00			
2	0.00	0.00		
3	0.00	0.00	0.00	
4		0.00	0.00	
5		0.00	0.00	0.00
6	0.00		0.00	
7	0.00	0.00		
8	0.00	0.00	0.00	0.00
9		0.00		
10		0.00	0.00	
11		0.00	0.00	0.00
12			0.00	
13			0.00	0.00
14		0.00		
15		0.00	0.00	
16		0.00	0.00	0.00
17			0.00	
18			0.00	0.00
19				
20				0.00
21				0.00
22			0.00	
23			0.00	0.00
24				
25				0.00
26				0.00
27				
28				
29				
30				
31				0.00
32				0.00

Fig. 2B

designation means for designating a region consisting of a predetermined number of neighboring pixels from pixels that for an input image (figure 1, reference 16; column 3, lines 42-48; the designation means is inherent to the invention; a printer must have a way to designate a region consisting of a predetermined number of neighboring pixels in order to properly form an image);

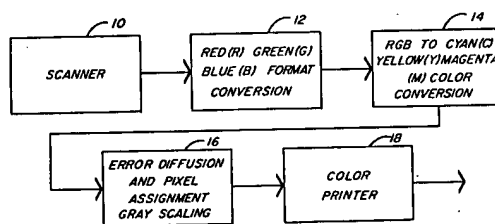


Fig. 1

selection means (figure 1, reference 16; column 2, lines 45-66; the selection means is also inherent to the invention; a printer must have a way to select the pixel density distribution pattern for the designated region in order to properly form an image); control means for controlling ejection/non-ejection of ink from the plurality of ink ejection print elements by looking up the second table in accordance with the pixel density distribution pattern selected by the selection means (column 2, lines 26-31)

- {claim 9} An ink-jet printing method (column 1, lines 13-19); a first table; a second table; a designation step; a selection step (as taught in claim 1)

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- {claim 14} the second table indicates a correspondence among the gray scale values, the pixel density distribution patterns, and the ink ejection print elements to be used for printing (figure 2B)

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 3 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chan et al (US Pat 5111302) in view of Tsao (US Pat 4651287).

Chan et al discloses, with respect to claim 3, an ink-jet printing apparatus (as taught in claim 3).

Chan et al differs from the claimed invention in that it does not disclose the selecting of the pixel density distribution pattern on the basis of a difference between a value of a pixel of interest of the pixels that form the region, and an average value of gray scale values of all pixels which form the region.

Tsao teaches, with respect to claims 3 and 11, “the image data, which represents picture elements of varying gray scale values, is partitioned into an image data array. In accordance with this method a print array is computed where each print value of the print array corresponds to each image datum. An error array is then computed by computing the **differences** between the print values (i.e. value of a pixel of interest) and the image data (i.e. an average value of gray scale values of all pixels which form the region).” (See column 4, lines 12-22)

It would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate the teachings of Tsao into the invention of Chan et al in order to select the pixel density distribution pattern on the basis of a difference between a value of a pixel of interest of the pixels that form the region, and an average value of gray scale values of

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all pixels which form the region. The motivation for the skilled artisan in doing so is to gain the benefit of getting high-quality images; these high-quality images are produced by applying the algorithm known as "error diffusion", which is well known to one of ordinary skill in the art, and which is implicitly described by the language of claims 3 and 11. Furthermore, the invention of Tsao also discloses the use of error diffusion (See column 2, lines 65-68).

4. Claims 4 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chan et al (US Pat 5111302) in view Sasaki (US Pat 4714964) and Tsao (US Pat 4651287).

Chan et al differs from the claimed invention in that it does not disclose that a plurality of combinations of density distribution patterns of the print pixels and ink ejection print elements are prepared for a single gray scale value, and the control means sequentially or randomly selects these combinations.

Sasaki discloses, with respect to claims 4 and 12, a plurality of combinations of density distribution patterns of the print pixels (See figure 2, references 0-16).

U.S. Patent Dec. 22, 1987 Sheet 1 of 2 4,714,964

FIG. 1
PRIOR ART



FIG. 2

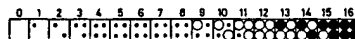
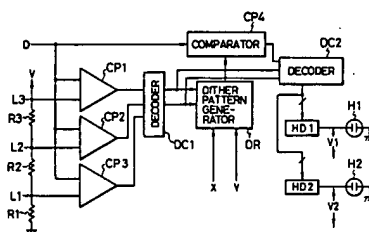


FIG. 3



Tsao teaches, with respect to claims 4 and 12, “A processing apparatus is provided to receive the image input array and for computing a print array of print values where each print value corresponds to one of a fixed number of gray scale values...” (See column 3, lines 64-68). Thus, Tsao teaches that the ink ejection print elements are prepared for a single gray scale value. Since the processing apparatus is receiving the density information through an array, it is inherent that the control means sequentially or randomly selects the combinations of density distribution patterns.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate the teachings of Sasaki and Tsao into the invention of Chan et al in order to prepare a plurality of combinations of density distribution patterns for a single gray scale value, where the control means sequentially or randomly selects these combinations. The motivation for the skilled artisan in doing so is to gain the benefit of improved image quality; by

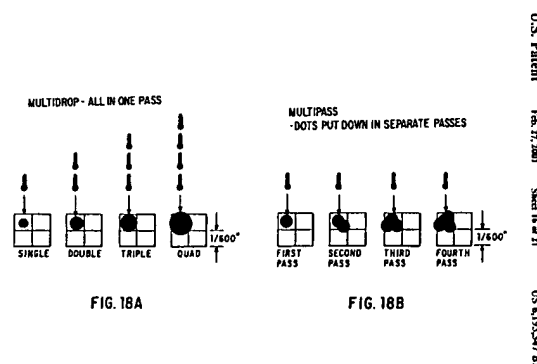
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being able to choose from a plurality of combinations of density distribution patterns, graininess can be reduced, and image quality can thus be improved.

5. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chan et al (US Pat 5111302), as applied to claim 1 above, and further in view of Askeland et al (US Pat 6193347).

Chan et al differs from the claimed invention in that it does not disclose that the control means controls an ink-jet printing method of discharging double ink droplets onto at least a single unit pixel, and prints the visible image by discharging one or a plurality of ink droplets onto the unit pixel.

Askeland et al discloses, with respect to claim 5, the discharging of double-ink droplets onto at least a single unit pixel (See Fig. 18A; column 16, lines 60-67).



It would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate the teachings of Askeland et al into the invention of Chan et al in order to discharge double ink droplets onto at least a single unit pixel. The motivation for the skilled artisan in doing so is to gain the benefit of being able to achieve good image quality. "The ability to achieve good tone scale is crucial to achieving photographic image quality...also, the ability to place more than one drop from a given printhead into a pixel is essential to achieving this photographic image quality." (See Askeland et al column 3, lines 59-67)

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6. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chan et al (US Pat 5111302), as applied to claim 1 above, and further in view of Askeland et al (US Pat 6193347) and Dispoto et al (US Pat 4680645).

Chan et al differs from the claimed invention in that it does not disclose that the control means controls an ink-jet printing method of discharging ink droplets having at least two different dot sizes, and prints the visible image by discharging one or a plurality of ink droplets onto a unit pixel.

Askeland et al discloses, with respect to claim 6, the discharging of ink droplets having at least two different dot sizes (See figure 18A; column 16, lines 60-67).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate the teachings of Askeland et al into the invention of Chan et al in order to discharge ink droplets having at least two different dot sizes. The motivation for the skilled artisan in doing so is to gain the benefit of achieving quality gray scale printing. Dispoto et al teaches, with respect to claim 6, "A further advantage of the invention is that now quality gray scale printing can be achieved at resolutions previously thought too low to be suitable for the ED approach. Specifically, it has been found that a gray scale image produced in accordance with the invention using a **variable dot size printer**...results in an excellent quality image free of image artifacts." (See column 2, lines 53-61)

7. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chan et al (US Pat 5111302), as applied to claim 1 above, and further in view of Toshiaki (US Pat 6338538).

Chan et al differs from the claimed invention in that it does not disclose that the control means controls an ink-jet printing method of discharging at least two multi-density ink droplets for the same hue, and prints the visible image by discharging one or a plurality of ink droplets onto a unit pixel.

Toshiaki teaches, with respect to claim 7, "The present invention relates to a printing system with a head, which **forms at least two different dots having different densities per unit area** on an object, for recording multi-tone images by the dots formed by the head, as well as to a method of recording such images." (See column 1, lines 8-12)

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It would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate the teachings of Toshiaki into the invention of Chan et al in order to discharge at least two multi-density ink droplets for the same hue, and to print the visible image by discharging one or a plurality of ink droplets onto a unit pixel. The motivation for the skilled artisan in doing so is to gain the benefit of improving the quality of a recorded image (See Toshiaki column 1, lines 61-67).

8. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chan et al (US Pat 5111302), as applied to claim 1 above, and further in view of Askeland et al (US Pat 6193347) and Inoue et al (US Pat 6354688).

Chan et al differs from the claimed invention in that it does not disclose that the plurality of ink ejection print elements are integrated and aligned, and express a halftone image by causing a plurality of ink dots to land on substantially a single print pixel on the print medium when they are scanned a plurality on a number of times in a scan direction different from the alignment direction while being moved relative to the print medium by a predetermined width in a direction different from the scan direction.

Askeland et al discloses, with respect to claim 8, a plurality of ink ejection print elements (See figure 1, references 18; column 2, line 32), which produce a plurality of ink dots to land on substantially a single print pixel on a print medium when they are scanned a plurality of number of times (See figure 18A, column 16, lines 60-67).

Inoue et al discloses, with respect to claim 8, the printing of a plurality of ink dots that are scanned in a direction different from the line-up direction (being moved relative to a print medium by a predetermined width is inherent to the invention). See figure 2.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate the teachings of Askeland et al and Inoue et al into the invention of Chan et al in order to allow the plurality of ink ejection print elements to be integrated and aligned, and express a halftone image by causing a plurality of ink dots to land on substantially a single print pixel on the print medium when they are scanned a plurality on a number of times in a scan direction different from the alignment direction while being moved relative to the print medium by a predetermined width in a direction different from the scan

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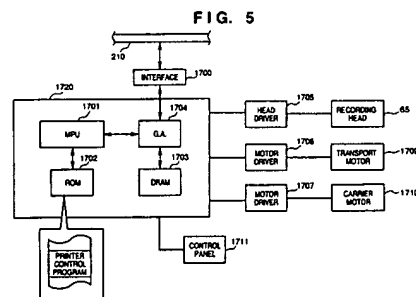
direction. The motivation for the skilled artisan in doing so is to gain the benefit of achieving greater image quality (See Askeland et al column 3, lines 59-67; column 4, lines 1-5).

9. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chan et al (US Pat 5111302) in view of Yashima et al (US Pat 6164747).

Chan et al discloses, with respect to claim 13, a first table providing step; second table providing step; designation, selection, control step (as taught in claim 1).

Chan et al differs from the claimed invention in that it does not disclose a computer readable memory that stores a program code of an ink-jet print process for printing a visible image on a print medium.

Yashima et al discloses, with respect to claim 13, a computer memory that stores a program code (figure 5, reference 1720; column 12, lines 25-52).



It would have been further obvious to one having ordinary skill in the art at the time the invention was made to include the computer readable memory disclosed by Yashima et al into the invention of Chan et al in order to store a program code of an ink-jet print process for printing a visible image on a print medium. The motivation for the skilled artisan in doing so is to gain the benefit of being able to “remember” the information produced by the designation, selection, and controlling steps; with computers being such a popular tool in today’s society, it would be impractical to store image pixel data without having a computer memory that stores a program code.

Allowable Subject Matter

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10. Claims 2 and 10 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claim 2 includes the limitation of "The apparatus...wherein said control means looks up the first and second tables on the basis of a value near a value obtained by dividing a sum total of gray scale values of pixels which form the region by the predetermined number of pixels," which was not found, taught, or suggested in the prior arts.

Claim 10 includes the limitation of "The method...wherein the control step includes the step of looking up the first and second tables on the basis of a value near a value obtained by dividing a sum total of gray scale values of pixels which form the region by the predetermined number of pixels," which was not found, taught, or suggested in the prior arts.

Response to Arguments

11. Applicant's arguments filed on 08/26/02 have been fully considered but they are not persuasive.

The applicant asserts that for Chan et al, "there is no disclosure or suggestion of a first table indicating a pixel density distribution pattern where a pixel density distribution within predetermined pixels is patterned..."

However, as shown in the rejection above, Chan et al clearly shows a first table indicating a pixel density distribution pattern where a pixel density distribution within predetermined pixels is patterned.

Final Rejection

12. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period

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will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Conclusion

13. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Berry (US Pat 3977007) discloses gray tone generation.

Logan (US Pat 4638373) discloses a method and apparatus for improving gray scale resolution in an ink jet printing system.

Itoh (US Pat 4595948) discloses a multicolor ink jet recording apparatus having means for preventing blurring of ink.

Murai (US Pat 4667250) discloses a halftone digital image-processing device.

Wen (US Pat 6352328) discloses digital ink jet printing apparatus and method.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Leonard S Liang whose telephone number is (703) 305-4754. The examiner can normally be reached on 8:30-5 Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John Barlow can be reached on (703) 308-3126. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7724 for regular communications and (703) 308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

lsl

LSL

December 13, 2002


John Barlow
Supervisory Patent Examiner
Technology Center 2800